

REMARKS

The Office Action dated July 1, 2005 has been reviewed carefully. Reconsideration and allowance of the claims are respectfully requested on the basis of the following remarks.

The Claims

Claims 1-28 are pending.

Independent Claims 1 and 11 have been amended to respectively recite, *inter alia*, the water-side liner comprising less than about 0.1% Cu but greater than 0% Cu and less than about 0.25% Mn but greater than 0% Mn, and following a brazing operation on the composite aluminum alloy structure, the Mg in the core layer and the water-side liner in combination with the Si, *imparting natural age hardening* of the composite aluminum alloy structure at room temperature.

Claims 2 and 9 have been amended to recite, *inter alia*, the core layer including less than about 0.5% ***Fe but greater than 0% Fe***.

Claims 18 and 21 have been canceled, without prejudice.

Claim 28 has been amended to recite, *inter alia*, the water-side liner including less than about 0.2% Fe ***but greater than 0% Fe***.

The Present Invention

The invention provides a unique combination of elements to provide a high-strength aluminum alloy tubestock for use, for example, in heat exchangers. The tubestock includes a core with low to moderate Si content to promote strengthening without excessively compromising corrosion resistance. Furthermore, it employs a braze liner on the core exterior and a Zn+Mg+Si water-side liner that will not experience undesirable melting during brazing. The water-side liner preferably comprises between about 0.2-0.5% Si, between about 2.5-5.0% Zn, between about 1.3-2.5% Mg, less than about 0.1% Cu but greater than 0% Cu, less than about 0.35% Fe and less than about 0.25% Mn but greater than 0% Mn, with the remainder comprising Al and tolerable impurities. The core preferably comprises between about 0.5-1.3% Mn, between about 0.1-0.3 Mg, between about 0.4-0.7% Cu, between about 0.15-0.5% Si, between about 0.01-0.25% Ti and less than about 0.5% Fe, with the remainder comprising Al and tolerable impurities. The composite package provides good brazeability and high post-braze strength due, at least in part, to natural age hardening at room temperature, after brazing. The independent claims, Claims 1 and 11 have been amended to expressly recite this distinct combination of elements and the advantageous yet rather unexpected natural age hardening that it affords.

Claims 1-3, 5-13, and 28: Rejected Under 35 U.S.C. 102(b)

Claims 1-3, 5-13, and 28 are rejected as being anticipated by U.S. Patent No. 6,261,706 (Fukuda et al.).

Regarding Claim 1, the Examiner states that Fukuda et al. teaches all of the elements of the claim. Applicant respectfully traverses this statement.

Independent Claim 1 has been hereby amended to recite, *inter alia*, a composite aluminum alloy structure including a core layer including between about 0.1-0.3% Mg and between about 0.15-0.5% Si; a water-side liner on one side of the core layer, the water-side liner comprised of between about 0.2-0.5% Si, between about 1.3-2.5% Mg, between about 2.5-5.0% Zn, less than about 0.1% Cu but ***greater than 0% Cu***, less than about 0.25% Mn but ***greater than 0% Mn*** and less than about 0.35% Fe, with the remainder comprising Al and tolerable impurities; and a braze liner on the other side of the core layer, wherein ***following a brazing operation on the composite aluminum alloy structure, the Mg in the core layer and the water-side liner in combination with the Si from all components of the composite aluminum alloy structure including the braze liner impart natural age hardening of the composite aluminum alloy structure at room temperature.***

The Fukuda et al. reference fails to teach or suggest all of the elements of the refined recital of amended Claim 1 and, therefore, fails to anticipate the claim under 35 U.S.C. § 102(b).

First, as noted by the Examiner at page 2, paragraph 4 of the July 1, 2005 Office Action, Fukuda et al., at best, teaches a water-side liner comprising 0% Cu and 0% Mn. Thus, Cu and Mn in the water-side liner, particularly within the range claimed in the refined recital of amended Claim 1, is not taught or suggested anywhere in the disclosure of the reference. This view is further confirmed by Table 2, which does not even list Cu or Mn among the elements present in the sacrificial anode material. Accordingly as two of the elements of amended independent Claim 1 are not taught or suggested by the reference, the reference does not anticipate the claim.

Furthermore, Fukuda et al. does not teach or suggest, but in fact teaches away from the post-braze natural age hardening provided by the combination and content of the elements of the composite alloy of the invention, as recited in amended Claim 1. This view is supported at page 6, lines 4-11 of Applicant's disclosure wherein the Fukuda et al. patent is expressly distinguished as exhibiting low post-braze strength, whereas "the tubestock composite of the present invention strengthens at room-temperature, over time" and "further strengthening occurs upon exposure to temperatures that are representative of service

temperatures for heat exchangers, such as, for example, automotive radiators and heater cores.” Applicant’s Table 2 at page 11, which categorizes strength over time, confirms the “considerably higher” post-braze strength of the composite alloy of the invention, over time. See also, Applicant’s specification at page 9, lines 20-26 (stating that during brazing, Mg in the anodic water-side liner diffuses into the core material together with some Si and creates conditions that will promote age hardening after brazing).

Conversely, Fukuda et al. at, for example, Table 7, which depicts the combination of the core material (*i.e.*, B1) with sacrificial anode material (*i.e.*, a1), teaches poor brazeability and relatively low tensile strength after brazing. Accordingly, the reference not only fails to teach or suggest one or more elements of the claimed invention, but it in fact also expressly teaches away from this particular important feature of the invention.

As noted, independent Claim 1 has been hereby amended to expressly recite the foregoing distinctions and, therefore, overcomes the Examiner’s rejections with respect thereto. Reconsideration and allowance of Claim 1 is requested.

Claims 2-3, and 5-10 depend from amended independent Claim 1 and, through such dependency are also patentable. Claims 3, 6-8 and 10 are not separately asserted to patentable apart from their dependency on Claim 1. Claims 2, 5 and 9 are further patentable over the reference for the following reasons.

Claims 2 and 9 have been amended to both recite, *inter alia*, the core layer including less than about 0.5% Fe **but greater than 0% Fe**. It is submitted that Fukuda et al. does not teach or suggest the Fe content of the refined recital of amended Claims 2 and 9. Conversely, Fukuda et al. expressly teaches away from such content by teaching, in all instances, 0% Fe in the core.

Regarding Claim 5, the Examiner acknowledges that the water-side liner disclosed in Fukuda et al. does not teach or suggest the Si content of 0.2-0.28% recited in Claim 5. The Examiner states that this deficiency is made up for by the disclosure at column 3, lines 5-12 which states that “the sacrificial anode material comprises an aluminum alloy comprising 1.5-8% of Zn, 0.01-0.8% of Si, and 0.01-0.3% of Fe...”. However, this separate disclosure fails to disclose the remaining elements of the claimed water-side liner (Cu, Mn, and Mg) and, therefore, does not anticipate the claim.

Claim 11 is an independent claim which, similar to Claim 1, has been hereby amended to recite, *inter alia*, a composite aluminum alloy tubestock for use with a heat exchanger, and including: a core having a first side and a second side, the core comprised of between about 0.5-1.3% Mn, between about 0.1-0.3% Mg, between about 0.4-0.7% Cu,

between about 0.15-0.5% Si, between about 0.1-0.25% Ti and less than about 0.5% Fe, with the remainder comprising Al and tolerable impurities; a water-side liner on the first side of the core, the water-side liner comprised of between about 0.2-0.5% Si, less than about 0.1% Cu ***but greater than 0% Cu***, less than about 0.25% Mn ***but greater than 0% Mn***, less than about 0.35% Fe, between about 1.3-2.5% Mg and between about 2.5-5.0% Zn, with the remainder comprising Al and tolerable impurities; and a braze liner on the second side of the core, the braze liner comprised of a brazing filler metal consisting of an Al-Si-base alloy, ***wherein following a brazing operation on the composite aluminum alloy tubestock, the Mg in the core layer and the water-side liner in combination with the Si from all components of the composite aluminum alloy tubestock impart natural age hardening of the composite aluminum alloy tubestock at room temperature.***

Accordingly, amended independent Claim 11 is patentable over Fukuda et al. for reasons similar to those previously discussed in connection with amended independent Claim 1. Specifically, Fukuda et al. fails to teach or suggest all of the elements of the claim and, therefore, fails to anticipated it under 35 U.S.C. § 102. More specifically, Fukuda et al. does not teach the claimed composition of the exemplary water-side liner and, in particular, the claimed content of Cu and Mn in the water-side liner. The reference further fails to teach or suggest, but in fact expressly teaches away from the post-braze natural age hardening and associated high strength associated therewith, of the invention.

Claims 12-13, 15-26 and 28 depend from independent Claim 11 and, through such dependency are also patentable over the reference. Claims 12, and 16-26 are not separately asserted to be patentable apart from their dependency on Claim 11. Claims 13, 15 and 28 are further patentable over the reference for the following reasons.

Regarding Claims 13 and 15, the Examiner at page 4, paragraph 2 acknowledges that the reference fails to teach or suggest a single example or disclosure which contains all of the limitations recited in the claimed invention and, in particular, the compositions of Mn and Mg recited in Claims 13 and 15, respectively. It is submitted that it would be improper to pick and choose thus arbitrarily combining different segments of disclosure from a variety of different examples until the recited combination is eventually achieved by the conglomeration of the segmented disclosures. To cross-combine certain aspects of the disclosed examples, but not others, would require at least partial destruction of the teachings of the individual examples in a manner not taught or suggested by the prior art. Accordingly, as no single example or other disclosure recites all of the elements of Claims 13 and 15, the claims are not anticipated.

Claim 28 has been amended to recite, *inter alia*, the water-side liner including less than about 0.2% Fe ***but greater than 0% Fe***. It is submitted that Fukuda et al. does not teach or suggest this Fe content, but rather teaches away therefrom by teaching, in all cases a 0% Fe content.

Accordingly, in view of the amendments made hereby, and the foregoing remarks, Claims 1-3, 5-13, and 28 are not anticipated by the Fukuda et al. reference. Reconsideration and allowance of the claims is requested.

Claims 4, 14, and 27: Rejected Under 35 U.S.C. 103(a)

Claims 4, 14, and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fukuda et al.

Specifically, the Examiner states that the difference between the Si content of 0.15-0.28% recited in Claims 4, 14, and 27 of the instant application, and the “as low as 0.30%” (Office Action page 4, last paragraph) Si content disclosed in Fukuda et al. at example A5 of Table 1 (column 7, lines 20-32) is not patentably significant because it would have been obvious to make the Fukuda et al. alloy with a core having a Si content of 0.28% in view of the closeness of the 0.3% Si content of example A5 to 0.28% of Si as recited in the claims, and because “all of the other elements are within the ranges claimed...” (emphasis added). Applicant traverses this analysis.

First, the Examiner’s statement is an overbroad generalization. It is a well known fundamental of patent law that even a slight variation in an element of an invention can result in a drastically different resultant product, which is patentable, particularly in an art which is particularly crowded, such as is the case here with respect to composite aluminum alloys. This patent law premise is particularly true in the instant case where the claim element at issue, Si content, is of particular importance and plays a significant role in the unique age hardening and good brazeability features of the composite alloy of the invention. As such, to find that a content of 0.15-0.28% would be obvious in view of Fukuda et al. which, at best, in only one example (*i.e.*, A5, Table 1) teaches a Si content of 0.3% while in all other instances requiring as much as 1.10% Si, would be improper.

Furthermore, the example cited by the Examiner as the basis of the obviousness rejection, example A5 of Table 1, expressly teaches 0% Mg, which not only fails to teach or suggest the 0.1-0.3% Mg content of the core as claimed in Claims 1 and 11 from which Claims 4 and 14 and 27 depend, but expressly teaches away from the claimed core material. Mg, as claimed, plays a key role in providing the advantageous properties of the invention. Accordingly, “all” of the elements and content ranges of the invention are not taught or

suggested by Fukuda et al., as stated by the Examiner. Conversely, Fukuda et al. teaches away from the claimed composition which, as recited, includes a core having a Mg content of 0.1-0.3%. As such, the *Titanium Metals Corp. of America* case cited by the Examiner is not analogous to the instant case, and not applicable where, as here, one or more elements are not taught or suggested and “all” of the compositions are not in “such close proportions.”

In view of the foregoing Claims 4, 14 and 27 are also patentable over the reference. It is submitted that to find otherwise would require an improper application of hindsight having had the benefit of viewing the details of the present invention.

Miscellaneous

The prior art made of record but not relied upon but considered pertinent to Applicants' disclosure has been carefully reviewed, but was not considered as relevant as the art that was applied.

SUMMARY AND CONCLUSION

In summary, Applicant respectfully submit that amended independent Claims 1 and 11 and Claims 2-10 and 12-28 which depend respectively therefrom are patentable over the references of record.

Applicant submits that the application is now in proper form for issuance of a Notice of Allowance. Reconsideration and early allowance are requested.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Grant E. Coffield", written in a cursive style.

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